REMARKS

Interview Summary

On December 1, 2010, an Examiner's Interview was conducted between the Examiner, the undersigned attorney, Dr. Marcus Fenton (co-inventor and employee of the assignee) and Dr. Harriet Holden (employee of the assignee). We thank the Examiner for the courtesies extended during the Interview.

During the Interview, Drs. Fenton and Holden showed a specimen of the invention and used it to generally show how the apparatus of the invention functions and the nature of the outlets. All claims that are pending and under examination and the documents cited in the pending Office Action – Rummel, Pennamen, and Base – were discussed. At the Interview, we discussed with the Examiner how the rejections appeared to misconstrue Rummel (*e.g.*, the lack of a convergent-divergent structure in the transport nozzle) and Pennamen (*e.g.*, droplet diameter size).

Applicants agreed to submit an RCE together with a Response, and a Declaration from Dr. Fenton explaining the above-identified matters in further detail. This paper presents the items agreed upon at the Interview.

Double Patenting Rejection

Claims 1-6, 8-12, 14, 15, 19-22, 28, 35-44, 46, 47, 49-52, and 56-60 stand provisionally rejected under nonstatutory double patenting over claims 52-89 of copending U.S. application serial no. 10/590,456. (Paper No. 20100707 at 2). In making the rejection, the Examiner asserts that "[t]he instant application is fully disclosed in the referenced copending application and would be covered by any patent

granted on that copending application since the referenced copending application and the instant application are claiming common subject matter...." (*Id.*).

Because neither the present application nor the '456 application has been allowed yet, the issue of a terminal disclaimer is still premature and should be held in abeyance until one or both applications has allowable subject matter. *See, e.g.*, MPEP §804 ("If a 'provisional' statutory double patenting rejection is the only rejection remaining in one of the applications (but not both), the examiner should withdraw the rejection in that application and permit that application to issue as a patent, thereby converting the 'provisional' double patenting rejection in the other application into a double patenting rejection when the application issues as a patent."). Thus, if the present application is allowed before the '456 application is allowed, the double patenting rejection in the present application should be withdrawn.

Accordingly, this rejection is respectfully deferred until there is allowable subject matter in the present application.

Rejections Under §103(a)

A. Claims 1-6, 8-12, 14, 15, 19-22, 28, 25-44, 49-52 and 56-60

Claims 1-6, 8-12, 14, 15, 19-22, 28, 25-44, 49-52 and 56-60 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Rummel, U.S. Patent Publication No. 2003/0150624 ("Rummel") in view of Pennamen *et al.*, U.S. Patent No. 5,810,252 ("Pennamen"). (Paper No. 20100707 at 4-11).

Rummel discloses a nozzle for foaming, spraying, or misting. The nozzle is principally used to foam cement, although other uses, such as fire extinguishing, are

briefly mentioned. (p. 4, para. 50). Generally, Rummel discloses a nozzle that includes a housing with an annular component. The annular component includes ducts for feeding a second medium, *e.g.*, a gas, a first inlet for feeding a medium to be foamed (*e.g.*, cement), and an outlet. (p. 5, para. 75). The ducts are disclosed to be configured as round bores to permit optimum flow conditions. (*Id.*, para. 79 and Figure 1).

Pennamen discloses methods and apparatus for atomizing a heavy, highly viscous liquid, such as, *e.g.*, an oil, to achieve good combustion of the oil. The Pennamen apparatus contains a head with a plurality of primary channels, the atomization orifices of which are regularly distributed on the head of the device in the form of a circular ring or in the form of two coaxial circular rings. (Col. 3, lns. 25-30). According to Pennamen, the apparatus is able to achieve atomization of, *e.g.*, oil, into "fine droplets of very small diameter, of the order of 100 thousandths of a millimeter." (Abstract; Col. 1, lns. 25-27). According to Pennamen, to obtain droplets of this size, the viscosity of the product must be less than 20 mm^2/s at the atomization temperature. (Col. 1, lns. 27-30).

When Pennamen was filed, for highly viscous liquids, such as oils, with a viscosity of 4,000 mm^2/s at 100°C, the atomization temperature had to be high – between about 200°-230°C – in order to reduce the viscosity of the product to about 20 mm^2/s to achieve good atomization by conventional methods. (*Id.* at 30-34). Pennamen provides two examples. (Col. 5, ln. 1 – Col. 6, ln. 2). In both examples, Pennamen's apparatus is able to atomize highly viscous liquids, such as oils, at considerably lower temperatures compared to conventional methods. (*Id.*). For the specified conditions, including an oil viscosity of 200 mm^2/s at 20°C, the apparatus was

able to atomize the highly viscous fluid into droplets having a Sauter mean diameter at the exit of "35 microns, with 90% of the droplets having a diameter of less than 120 microns and 99% of them having a diameter of less than 290 microns." (Col. 5, lns. 25-28; Col. 5, ln. 66 – Col. 6, ln. 2).

In making the rejection, the Examiner asserts that Rummel, Figure 5, discloses "an apparatus for generating a mist". (Paper No. 20100707 at 4). The Examiner further asserts that the Figure 5 apparatus comprises: "a conduit (26) having a mixing chamber (20) and an exit (2); and a means for creating a dispersed droplet flow regime, said means comprising: a working fluid inlet (6) in fluid communication with said conduit (26) to introduce a working fluid into the conduit (26); and a transport nozzle (5) in fluid communication with the said conduit (26) to introduce a transport fluid into the mixing chamber (20); wherein the transport nozzle (5) includes a convergent-divergent portion therein such as in use to provide for the generation of high velocity flow of the transport fluid; and wherein the transport nozzle (5) and conduit (26) have a relative angular orientation (α) at the mixing chamber (20) for the introduction of transport fluid flow from the transport nozzle (5) into working fluid flow from the conduit (26) and for shearing of the working fluid by the transport fluid, wherein the spray system is portable." (*Id.*). The Examiner acknowledges, however, that Rummel does not disclose that "a substantial portion of the droplets have a size of less than 10 μm." (*Id.*).

To fill the acknowledged gap, the Examiner relies on Pennamen as disclosing an apparatus that produces droplets in which "a substantial portion of the droplets have a size of less than 10 μm." (*Id.*) The Examiner concludes that "it would

have been obvious" to modify the droplets of Rummel with the size of the droplets in Pennamen "to utilize a fine droplet size." (*Id.* at 5).

It is well settled that the Examiner bears the burden to set forth a *prima facie* case of unpatentability. *In re Glaug*, 62 USPQ2d 1151, 1152 (Fed. Cir. 2002); *In re Oetiker*, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992); and *In re Piasecki*, 223 USPQ 785, 788 (Fed. Cir. 1984). If the PTO fails to meet its burden, then the applicant is entitled to a patent. *In re Glaug*, 62 USPQ2d at 1152.

One way in which an Examiner's burden is not met is when the Examiner misconstrues a document cited in a rejection. *See, e.g., Ex parte Jones*, 1994 WL 1687158, *1-*2 (B.P.A.I. 1994) (reversing a rejection under §103 because the Examiner misconstrued the primary reference, Cramer) and *Ex parte Ottesen*, 2009 WL 3030307, *6 (B.P.A.I. 2009) (reversing a rejection under §103(a) because the Examiner misconstrued the secondary reference, Law).

It is respectfully submitted that for the reasons set forth below, the Examiner has not met his burden.

I. Because Rummel Does Not Disclose Convergent-Divergent Flow, The Rejection Should Be Withdrawn

In the rejection, the Examiner asserted that Rummel discloses an apparatus for generating a mist wherein "the transport nozzle (5) includes a convergent-divergent portion therein such as in use to provide for the generation of high velocity flow of the transport fluid ...." (Paper No. 20100707 at 4). We respectfully submit that the Examiner has misconstrued Rummel at least with respect to an apparatus that has

a transport nozzle that includes a convergent-divergent portion as recited in the claims that are pending and under examination in this application.

In the DECLARATION OF MARCUS BRIAN MAYHALL FENTON, PH.D. UNDER 37 CFR §1.132 ("Decl.") submitted concurrently herewith, Dr. Fenton, who is an expert in the physics and engineering of mist generating apparatuses of the type herein claimed, opines that there is no disclosure in Figure 5 – or anywhere else – in Rummel of a transport nozzle having convergent-divergent flow. (Decl. paras. 12-15).

Indeed, in a CAD model comparing an apparatus according to the present invention to the Rummel Figure 5 apparatus, Dr. Fenton clearly shows that the Rummel apparatus has ducts that are arranged in pairs in opposite direction to each other and that the flow pattern generated by this structure is that of a flow passing from an annular cross-section into a series of holes or passageways. (*See, e.g.*, Decl., paras. 12-13). Based on the CAD analysis, Dr. Fenton unambiguously states, "[t]his, again, is not a convergent-divergent shape." (*Id.*, para. 12). In view of his review of Rummel and the CAD analysis, Dr. Fenton concludes that "one cannot view Rummel as disclosing or suggesting the use of a transport nozzle with a convergent-divergent portion ...." (*Id.*, para. 15).

In view of Dr. Fenton's expert opinion that Rummel does not disclose or suggest a transport nozzle with a convergent-divergent flow, it is clear that the Examiner has misconstrued Rummel. And, the rejection identifies no disclosure in Pennamen of a convergent-divergent shape. Because of the factual error with respect to Rummel and because the rejection identifies no disclosure in Pennamen to remedy this error, the Examiner's legal conclusion of unpatentability based on obviousness must fail. *See,*

e.g., *Ex parte Jones*, 1994 WL 1687158, *1-*2 (B.P.A.I. 1994) and *Ex parte Ottesen*, 2009 WL 3030307, *6 (B.P.A.I. 2009). Accordingly, for this reason alone, the rejection should be withdrawn.

II. Because Pennamen Does Not Disclose Droplets With Diameters of 10 Nanometers, The Rejection Should Be Withdrawn

In the rejection, the Examiner conceded that Rummel does not disclose the formation of droplets that have a size of less than 20 micrometers as recited in the rejected claims. The Examiner attempts to remedy this acknowledged gap with Pennamen, which the Examiner construes as disclosing an apparatus for generating a mist wherein "a substantial portion of the droplets have a size less than 10 μm." (Paper No. 20100707 at 4). We respectfully submit that the Examiner has misconstrued Pennamen at least with respect to apparatus, systems, and methods that generate a mist in which a substantial portion of the droplets have a size of "less than 20 μm" as recited in the claims that are pending and under examination in this application.

Simply put, we respectfully submit that the Examiner misconstrues the disclosure in Pennamen of the droplet sizes. The Examiner contends that "100 thousands of a millimeter" means 10 nanometers. (Paper No. 2010070 at 13). At bottom, the rejection cannot identify any evidence in Pennamen – or anywhere else for that matter – to support this position.

In contrast, as set forth in more detail below, we provide herewith (1) an expert declaration, (2) citations to Pennamen, and (3) an example of the conventional

usage of mathematical expressions in the art to support our contention that "100 thousands of a millimeter" means 100 micrometers (microns).

In the Declaration, Dr. Fenton demonstrates mathematically that the expression "100 thousands of a millimeter" means 100 μm (microns) (*see, e.g.*, para. 19) not 10 nanometers (*see, e.g.*, paras. 21-22). As Dr. Fenton opines, to express 10 nanometers in the style of Pennamen would require reading into the specification an additional "1", namely "1 hundred thousandths of a millimeter".

Dr. Fenton further opines that all of the data, examples, and claims in Pennamen that disclose or recite a droplet size do so in the context of droplets that are of the order of 100 microns – not 10 nanometers. (*See, e.g.*, Decl., para. 20; and Pennamen, Col. 5, ln. 1 – Col. 6, ln. 2, and claims 1, 3, 9, and 10). As Dr. Fenton concludes, all of the droplet diameter data disclosed in Pennamen are several orders of magnitude larger than the "10 nanometers" alleged by the Examiner. (Decl., para. 21).

Lastly, citing to the Turpin article, Dr. Fenton demonstrates that the Examiner's interpretation of Pennamen would fly in the face of convention. (*See*, Decl., para. 23).

We further note that in a primer on reading a micrometer, a device used for precise measurement of small distances, such devices are read in a manner consistent with Dr. Fenton's interpretation of Pennamen. For example, attached hereto as Exhibit A is a part of Appendix B to an automotive transmission course. Page 200 of Appendix B clearly equates "one hundred thousandth" to "(0.100)":

> Count the number of one hundred thousandth (0.100) divisions that are visible on the reading line = 1 or 0.100.

(Exhibit A, Appendix B, p. 200).

Accordingly, even the instrumentation that is commonly used to make precise measurements in the engineering field uses the kind of nomenclature disclosed in Pennamen – but in a manner consistent with Dr. Fenton's explanations – not as construed in the rejection.

Thus, when properly construed, Pennamen discloses a device that produces droplets having a mean diameter of 35 microns, with 90% of the droplets having a diameter less than 120 microns. The properly construed droplet size in Pennamen does not disclose or suggest a dispersed droplet flow regime in which "a substantial portion of the droplets have a size of less than 20 micrometers" as recited, *e.g.*, in claims 1 and 39.

In view of the foregoing, we respectfully submit that the Examiner has misconstrued Pennamen. Because of this factual error and because the rejection concedes that Rummel does not and cannot remedy this error, the Examiner's legal conclusion of unpatentability based on obviousness must fail. *See*, *e.g.*, *Ex parte Jones*, 1994 WL 1687158, *1-*2 (B.P.A.I. 1994) and *Ex parte Ottesen*, 2009 WL 3030307, *6 (B.P.A.I. 2009). Accordingly, for this reason also, the rejection should be withdrawn.

B. Claims 46 and 47

Claims 46 and 47 stand rejected under 35 U.S.C. §103 as being unpatentable over Rummel, U.S. Patent Publication No. 2003/0150624 ("Rummel") in view of Pennamen *et al.*, U.S. Patent No. 5,810,252 ("Pennamen") and Base *et al.*, U.S. Patent No. 6,003,789 ("Base"). (Paper No. 20100707 at 12).

Rummel and Pennamen have been summarized previously. (*See*, Sect. A, *supra*). Base discloses a nozzle assembly for producing and atomizing a mixture of oil and steam, for injection into the chamber of a reactor, such as a fluidized bed coker. The assembly includes a mixing means external of the reactor, for producing a bubbly flow mixture of oil and steam, and an atomizing nozzle, internal of the reactor, for converting the mixture into a jet of fine liquid droplets. (Col. 1, lns. 5-13). The nozzle is disclosed to be able to accelerate the mixture of steam and oil to supersonic velocities. (*See*, *e.g.*, Abstract and Col. 4, ln. 51). The nozzle assembly produces droplets with a mean diameter ranging from 250-350 μm. (*See*, *e.g.*, Col. 3, ln. 52 and Col. 7, ln. 44). The mixture of oil and steam were pre-mixed prior to entry into the atomization nozzle. (*See*, *e.g.*, Col. 4, ln. 26 – Col. 5, ln. 13)

In making the rejection, the Examiner relies on his description of Rummel and Pennamen in the prior rejection. (*See*, Paper No. 20100707 at 4-11). The Examiner then concedes that Rummel does not disclose "introducing the transport fluid into the mixing chamber as a supersonic flow or a sub-sonic flow." (*Id.* at 12). To fill this acknowledged gap, the Examiner relies on Base as disclosing "introducing the fluid into the mixing chamber as a supersonic flow or a sub-sonic flow." (*Id.).* The Examiner then concluded that it would have been obvious "to modify the velocity of Rummel *et al.* [sic] with that of Base *et al.* to reduce droplet size (abstract)." (*Id.*).

Initially, we note that both claims 46 and 47 depend from independent claim 39, which claim was rejected over Rummel in view of Pennamen in the previous rejection. (*See*, Paper No. 20100707 at 4-11). Thus, we incorporate by reference all of our arguments traversing the previous rejection here. (*See*, Sect. A, *supra*).

Accordingly, we respectfully submit that the present rejection of claims 46 and 47 must fail at least for the reasons previously set forth in Sect. A, *supra*. In this regard, we note that Base does not remedy the deficiency in Rummel as to the lack of a disclosure of a transport nozzle that includes a convergent-divergent portion therein to provide for the generation of high velocity flow of the transport fluid. We further note that rejection does not – and cannot – identify where in Base there is disclosed " ... introducing a flow of transport fluid into a mixing chamber through an annular transport nozzle; [and] introducing a working fluid into the mixing chamber through an annular working nozzle..." as recited in, *e.g.*, claims 39/46 and 39/47. At best, in Base, the transport fluid and the working fluid are premixed to form a bubbling flow prior to entry into the nozzle. (*See*, *e.g.*, Col. 4, lns. 62-66 and Figs. 4-6).

Furthermore, Base fails to remedy the gap in Pennamen, namely the disclosure of a device that produces droplets having a mean diameter of 35 microns, with 90% of the droplets having a diameter less than 120 microns. The properly construed droplet size in Pennamen does not disclose or suggest a dispersed droplet flow regime in which "a substantial portion of the droplets have a size of less than 20 micrometers" as recited in claims 39/46 and 39/47. At best, Base discloses droplet sizes of between 250-350μm. Such droplets are more than 10X larger than the ones recited in claims 39/46 and 39/47.

In view of the foregoing, we respectfully submit that the rejection is deficient as a matter of fact and law. *See*, *e.g.*, *In re Glaug*, 62 USPQ2d at 1152., *Ex Parte Jones*, 1994 WL 1687158, *1-*2 (B.P.A.I. 1994) and *Ex parte Ottesen*, 2009 WL

3030307, *6 (B.P.A.I. 2009). Accordingly, for the reasons set forth above, the rejection should be withdrawn.

For the reasons set forth above, withdrawal of the rejections and allowance of the claims is respectfully requested. If the Examiner has any questions regarding this paper, please contact the undersigned.

I hereby certify that this correspondence is being transmitted in accordance with 37 CFR §§1.6(a)(4) and 1.8 via the U.S. Patent and Trademark Office (USPTO) electronic filing system (EFS-Web) to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on February 7, 2011.

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Respectfully submitted,

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